REMARKS

Claims 1, 11, 15, 28, 32, 43, and 47 have been amended and claims 3, 35, and 54-55 have been cancelled. No new matter is introduced by the amendments of these claims. The amendments of claims 1, 15, 32, and 47 are supported by page 11, lines 1-4, among other places. Claims 1-2, 4-32, and 36-53 remain pending.

The Examiner rejected claims 15, 17, 19, and 26-27 under 35 U.S.C. §102(b) as being anticipated by Sato (U.S. patent 5,457,725). The Examiner has also rejected claims 1-6, 8-9, 11-14, and 54 under 35 U.S.C. §102(e) as being anticipated by Yun (US 2003/0223536). Additionally, claims 1-2 are rejected under 35 U.S.C. §103(a) as being unpatentable over Ladell (U.S. patent 3,046,399). Claims 7, 10, and 53 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yun in view of Cairns (U.S. patent 4,110,625). Claims 1-2, 5, and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Parobek (U.S. patent 4,959,848). Claims 15-22 and 28 are rejected under 35 U.S.C. §103(a) as being unpatentable over Parobek in view of Jenkins (U.S. patent 4,472,825). Claims 32, 35, and 41-43 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koenig (U.S. patent 3,663,812). Claims 23-25, 29-31, 48, and 55 are rejected under 35 U.S.C. §103(a) as being unpatentable over Sato in view of Yun. Claims 36-40 and 44-46 are rejected under 35 U.S.C. §103(a) as being unpatentable over Koenig in view of Yun. The Examiner's rejections are respectfully traversed as follows.

Claim 1 is directed towards a "method of inspecting a defect in or on a semiconductor wafer." Claim also recites "directing a beam towards the surface of the semiconductor wafer wherein/whereon the defect resides to thereby emit X-rays" and "detecting the emitted X-rays with plurality of detectors positioned at a plurality of angles with respect to the wafer surface; collecting X-ray data from the detectors." Claim 1 further recites "based on the X-ray data collected from the detectors at the plurality of angles, determining a location of the defect in three dimensions in relation to a plurality of different process layers of the wafer." Independent claim 15, 32, and 47 also recite operations or mechanisms for determining a location of a defect in three dimensions in relation to a plurality of different process layers of the wafer based on X-rays collected at multiple angles.

The location of defects in three dimensions, in relation to a plurality of different process layers of the wafer, can be vital information for engineers to accurately determine the root causes of defects. For example, if a particle defect is introduced in a deposition chamber during a deposition process, the particle may be embedded with the material of the deposition process layer. Whereas, if the particle was introduced after the deposition process, the particle will likely not be embedded within the material of the particular deposition process layer but rather reside on top of the wafer surface or within another process layer besides the particular deposition

layer. Likewise, it is important for engineers to know the spatial location of other defects such as scratches, indentations, bumps and other irregularities in relation to the various layers of the wafer structure. Accordingly, embodiments of the present invention facilitate such capabilities.

The primary reference Sato appears to be directed towards using X-rays to only determine a surface contaminant's composition. See Abstract and operation 4 of Fig. 2. Nowhere does Sato teach or suggest using X-rays collected at multiple angles to determine a defect's location in three dimensions in relation to a plurality of different process layers of the wafer, in the manner claimed. Although the primary reference Yun is discloses techniques for imaging an element using X-rays [0005], this imaging is accomplished by preferential imaging of particular elements using a spectral filter [0008] so that these elements are highlighted individually in an image. However, Yun does not appear to teach or suggest locating a defect using such imaging techniques. Additionally, although Yun briefly mentions forming a three dimensional image using X-rays [0075], Yun fails to teach or suggest using X-rays collected at multiple angles to determine a defect's location in three dimensions in relation to a plurality of different process layers of the wafer, in the manner claimed.

The primary reference Ladell is directed toward using X-rays to only identify constituent elements of a composition. See Col. 1 lines 55-65. The reference Parobek is directed towards using X-rays to determine only the thickness of a thin film and the concentration of selected elements within the thin film. See Abstract and Col. 2, Lines 1-10. The reference Koenig is also directed towards using X-rays to identify elements of a composition. See Abstract and Col. 3, Lines 27-30. However, Ladell, Parobek, and Loenig each fail to teach or suggest mechanisms for utilizing X-rays collected at a plurality of angles to determine a location of the one or more defects in three dimensions and in relation to a plurality of different process layers of the wafer, in the manner claims. The secondary reference Jenkins also fails to teach such limitation. For the forgoing reasons, it is respectfully submitted that independent claims 1, 15, 32, and 47 are patentable over the cited references.

The Examiner's rejections of the dependent claims are also respectfully traversed. However, to expedite prosecution, all of these claims will not be argued separately. Claims 2, 3-14, 16-31, 36-46, and 48-53 each depend directly or indirectly from independent claims 1, 15, 32, or 47 and, therefore, are respectfully submitted to be patentable over cited art for at least the reasons set forth above with respect to claims 1, 15, 32, or 47. Further, the dependent claims require additional elements that when considered in context of the claimed inventions further patentably distinguish the invention from the cited art.

Applicant believes that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

Respectfully submitted,
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